

Water Quality Protection Report

United Refining Company
NPDES PA0005304

City of Warren
Warren County

Discussion

This is a renewal of a NPDES Permit for existing discharges from a petroleum refinery. This facility currently processes approximately 61,400 barrels of crude a day. The technology limitations were based on the 61.4 Mbbl/day. The previous permit had provisions for a new coker operation, which would of increased production, but the project never materialized. There are a total 16 permitted outfalls at this facility.

The permitted discharges include the outfalls at the 92 acre refinery site and also stormwater outfalls at the Cobham Park Tank Farm, which is approximately 3 miles north east of the refinery. The tank farm has a storage capacity of approximately 200,000 barrels of blended crude oil. The blended crude is brought to the refinery by pipeline. They process primarily Canadian crude. No major changes to facility operations were made since the last NPDES Permit renewal.

There are multiple city storm sewers than run through and discharge along at approximately 1.5 mile stretch of the refinery along the Allegheny River. The refinery does not contribute any wastewater or stormwater to any of these outfalls and therefore they are not accounted for in this permit.

Wasteflow

Outfall	Source of Pollutants	Flow (MGD)
001	Petroleum refining operations, boiler blowdown, cooling tower blowdown, contaminated groundwater, housekeeping wastewater, and stormwater	0.844 (design)
003	Boiler blowdown, non-contact cooling water, stormwater	5.744
004	Non-contact cooling water	0.375
005*		3.0
006*		2.2
007, 014, 015, 017*	Stormwater associated with industrial activities	
008	Steam condensate and stormwater associated with	0.015
009	industrial activities	0.006
010		0.03
011		0.03
012		0.03
013		0.03
016*		n/a

* - Designed as overflows, do not normally discharge

Stream Flow

The stream flow used for modeling the discharges at the refinery was calculated using the Allegheny River @ the Hickory Street Bridge gage (USGS 03016000)(1966-1996) and Conewango Creek @ Russell gage (USGS 0301500)(1966-1996). The same time period of data reporting was used for more accurate calculations. The Q7,10 for Conewango Creek was subtracted from the Q7,10 for the Allegheny River gage (671 cfs – 108.3 cfs) to get 562.7 cfs. Then the drainage areas for the two gages were subtracted in the same manner (3130 sq mi – 897 sq mi) to get 2233 square miles. The yield used to find the Q7,10 at the refinery therefore was calculated (562.7 cfs/2233 sq mi) to get 0.252 cfs/mi. Refer to the 2006 WQPR for an in-depth look at how the yield was determined.

Technology Limitations

Outfall 001, 003, 004, 005, and 006 are subject to an ELG under 40 CFR 419 Petroleum Refining – Subpart B (Cracking and Coking). Outfall 001 is regulated as process wastewater with stormwater allowance factors for stormwater it receives. The derivation of the technology-based limits is attached for 001. Stormwater allowance factors can be applied for flows exceeding the treatment plant design flow rate that can be contributed to stormwater.

Outfall 003, 004, 005, and 006 are regulated as once through cooling water and stormwater associated with industrial activities (003). A TOC limit based on the ELG is listed for these outfalls. Stormwater allowance factors for TOC and Oil and Grease at Outfall 003 may be applied for flows exceeding the design flow that can be attributed to stormwater.

oil and grease limits are technology based limits based on 25 PA Code § 95.2.

TSS monitoring for dry weather discharges at Outfalls 008, 009, 010, 011, 012, 013, and 016 is being required in order to collect data and determine if effluent limits and/or further treatment will be needed at a later date since the steam condensate is considered a non-process wastewater that may be susceptible to effluent limitations.

Toxics Modeling

Stream Background Concentrations

Background water quality was determined using the WQN Gage No. 866 on the Allegheny River near Warren data from 1998 to 2004 for total iron, total manganese, hardness, and pH.

Ammonia nitrogen used data from WQN 866 July-Sept values from 1996-1998.

Background concentration for CBOD5 was from a October 1995 sample at WQN 866.

PENTOXSD Version 2.0b was used to model Outfall 001, 003, and 004 which were each modeled individually. Outfall 003 neglected the small reach that the discharge travels on Glade Run (0.044 miles) and modeled the reach after it reaches the Allegheny River.

WQM 7.0 was also used to model Outfall 001 to determine if ELG correlating concentrations for BOD5 and ammonia nitrogen were protective of the receiving stream.

TOXIC LIMITATIONS

WQM 7.0 Modeling did not show the need for any water quality based limits.

PENTOXSD 2.0b modeling was conducted inputting parameters that were given a technology based limit from an ELG, had a detectable quantity reported in the renewal application, or using the Method Detection Limit (MDL) for Pollutant Groups 3, 4, and 5 if the pollutants had water quality criteria published in Chapter 93. Modeling was conducted using the long term average flow rate at Outfall 001

No WQBELs were calculated at Outfall 003 or 004. 4 parameters were found to require WQBELs at Outfall 001, the main facility outfall because the WQBELs calculated were less than the detection limits. The parameters were acrolein, acrylonitrile, benzidine, and vinyl chloride. These parameters were discussed with United Refining at a site visit on 11/9/2010. United Refining then did some further research and submitted responses as to why limits for these parameters were not needed in the renewed permit in a response letter submitted on 12/22/2010 with changes to the application and discussion in response to issues brought up at the site visit. After reviewing the responses on the four toxic parameters, it is agreed that these parameters are either not present or acceptable under revised MDLs submitted by the laboratory that did the testing for the application. No WQBELs will be added to the renewed permit as a result of WQM 7.0 or PENTOXSD Version 2.0b modeling.

PWS Evaluation

The Aqua Pennsylvania, Inc. – Emlenton water intake is located on the Allegheny River, approximately 89 miles downstream was used to evaluate chloride, TDS, fluoride, NO₃-NO₂, sulfate, and phenolics to make sure they are protective of PWS criteria at the border. Gage stations used for background concentrations at the water supply were WQN 804 Allegheny River @ Parker for chloride and NO₂-NO₃; WQN 867 Allegheny River @ Kennerdell for TDS and sulfate. As a result of the mass balance calculations using applicable criteria, there is no reasonable potential for any of the current discharge levels of these parameters to violate drinking water standards. No limits will be applied based on this evaluation.

Temperature

The total flow from Outfalls 001, 003, 004, 005, and 006 was evaluated as a worst-case scenario. The temperature model indicated that no limitations were needed. A special condition will still be included that states no more than a two degree fahrenheit temperature change in the stream may occur in any one hour of the day. The condition is standard for all heat related discharges.

Total Dissolved Solids

TDS concentrations listed on the renewal application for Outfall 001 average 1500 mg/l with a maximum of 1970 mg/l for three samples. 25 PA Code Chapter 95.10 has been revised and is now effective which deals with wastewaters that exhibit high concentrations of TDS.

Section VI of the Department's guidance "Policy and Procedure for NPDES Permitting of Discharges of Total Dissolved Solids (TDS) – 25 Pa. Code §95.10" states that for non- natural gas operations with discharge concentrations of TDS consistently above 1,000 mg/l and approaching 2,000 mg/l on occasions may be given monitoring requirements. Monitoring

requirements are included in the permit to gain information on TDS mass volumes at the site. Any significant increase in the waste stream in the future may warrant placement of effluent limits. The increased loading would then be subject to a 500 mg/l allowance and would require further treatment.

Hydrostatic Testing

Prior to 1999, hydrostatic test water was discharged after written notification along with sampling of a few parameters. Around the year 1999, a general permit was created for facilities that did hydrostatic testing. It was decided at that year to include the effluent limits and some of the conditions of the general permit into the Individual Industrial Waste NPDES Permit.

Chemical Additives

There were a total of 36 chemical additives evaluated as part of the renewal at Outfall 001 and/or 003. Questions over toxicology data and usage rates from the original application were discussed and revised during telephone conversations with Craig Anderson of United Refining and a December 22, 2010 response letter. Two parameters are test polymers which were submitted for approval of use in a November 5, 2010 letter. All additives are approved for use at the current or proposed usage rates.

Stormwater

There are 11 Outfalls that are permitted primarily for the discharge of stormwater. Additionally, Outfall 001 and 003 are primarily wastewater but they also receive some stormwater runoff. Of the 11 primary stormwater outfalls, 7 of those also reportedly receive steam condensate. Sampling of these 7 outfalls was therefore separated into two different stages: One during storm events where ELGs would be applied and one during dry weather events where discharge would primarily be steam condensate. The steam condensate is considered non-processes wastewater so no ELGs apply to this discharge.

Two of the eleven outfalls are overflows, which one is also a receiver of steam condensate, and do not discharge except for emergency situations. These two were given effluent limits but no monitoring will need to be conducted as long as a discharge does not occur.

Stormwater sampling that was submitted with the NPDES renewal application was compared to stormwater Benchmark values found on the EPA Multi-Sector General Permit for stormwater Fact Sheet. aluminum, total iron, TSS, and zinc were found to exceed benchmark values for a majority of outfalls and indicate these parameters can be a concern at the refinery facility. Quarterly stormwater monitoring of these four parameters at all 11 stormwater outfalls is being required in order to gather more data to make a determination of whether measures will be needed to reduce or eliminate the presence of these parameters or if they can be removed.

Spills

There were 20 significant leaks and spills reported in the renewal application. A gradual decrease in number of incidents can be seen since 2004. Some of these incidents can be traced to historical groundwater impacts onsite which are being addressed under the Environmental Cleanup Section of the Department.